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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/258,961	03/01/1999	TONGBI JIANG	98-0645.1	4605

7590 12/09/2002

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EXAMINER

PAREKH, NITIN

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 12/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/258,961

Applicant(s)

Jiang et al

Examiner

Nitin Parekh

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Sep 24, 2002
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 24-36 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 24-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 2 and 6 6) ☐ Other:

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DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 24-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) in view of Lee et al (US Pat. 5796586), Akram et al (US Pat. 5739585) and Hoffman et al (US Pat. 5360942).

Regarding claim 24, the admitted prior art (Fig.1A and B; pages 2-4) discloses a semiconductor package comprising :

- a substrate comprising a first surface, a second surface, a plurality of conductors and ball bonding pads formed on the first surface and a bonding opening from the first surface to the second surface
- a semiconductor die having a first outline and a face being aligned with the bonding opening and attached/bonded to the second surface on a die attach area
- first mask on the first surface of the substrate comprising a plurality of via openings aligned with the ball bonding pads, the mask partially covering the conductors

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- a second mask substantially covering a second surface of the substrate
- an adhesive layer between the die/face and the substrate in the die attach area to bond the die/face to the second mask and the substrate,
- a plurality of wires placed through the bonding opening and wire bonded to the die and to the conductors
- an encapsulating material/resin on the die and the second mask, and
- a conventional glob top/polymer in the bonding opening encapsulating the wires.

The admitted prior art (APA) fails to specify:

- a) directly bonding the die to the second surface and having an opening in the second mask including a second outline corresponding to but only slightly larger than the first outline, and
- b) the adhesive layer comprising a filled adhesive/epoxy configured to transfer heat from the face to the second surface.

a) Lee et al teach using a conventional die bonding structure where the die attach area has an adhesive but is not covered with solder mask so that the die attaches directly to the substrate surface (Col. 6, line 30; Col. 8, line 7; Fig. 1-7).

Lee et al teach using a second mask having an opening through the mask with a second outline (see hatched mask area 218' with a second outline- Fig. 7; Col. 7, line 55) substantially matching that of the first outline with an open die attach area (see first

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outline area 204- Fig. 7) on the second surface so that the die is directly bonded to the second surface to reduce the encapsulation defects (Fig. 7 and Fig. 1-6; Col. 1-8).

Lee et al further teach using solder mask patterns where the second outline is larger than the die attach region (Fig. 1A and B).

b) Akram et al teach using conventional die attach technique where the die (18 in Fig. 10; Col. 9, line 24) is face-bonded to the second surface using typical adhesive materials (Col. 4, line 26) such as an epoxy, silicone, polyimide, other dielectric material, etc. The cited reference by Shim et al teach using a conventional heat conductive epoxy (3 in Fig. 4) to provide the desired adhesion and heat dissipation.

Hoffman et al teach using conventional die attach/adhesive material comprising a filled epoxy (40 in Fig. 3) configured to provide improved heat transfer and/or electrical conductivity (Col. 3, line 60- Col. 4, line 2).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to use a second mask having an opening and a second outline corresponding to but only slightly larger than the first outline so that the die is bonded directly to the second surface using a filled adhesive so that the bonding and heat transfer from the chip to the substrate can be improved and the encapsulation defects can be reduced using Lee et al, Akram et al and Hoffman's bonding structure in the admitted prior art.

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Regarding claims 25 and 26, the claim elements have been addressed in the rejection as explained above for claim 24.

Regarding claim 27, as explained above for claim 24, the APA further discloses the first mask having a first opening exposing the wire bonding pads (Fig. 1A).

Regarding claim 28, the claim elements have been addressed in the rejection as explained above for claim 27.

Regarding claim 29, as explained above for claim 24, the APA further discloses the first and second solder masks comprising a conventional photoimageable material (Specification pp. 2-4).

Claims 30-36, the claim elements have been addressed in the rejection as explained above for claims 24 and 27.

Response to Arguments

3. Applicant's arguments filed on 09-24-02 have been fully considered but they are not persuasive.

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A. Applicant contends that there is no motivation to combine Lee et al with the APA.

However, as explained above, the APA fails to specify bonding the die face to the substrate with an adhesive layer in the die attach area which does not have a solder mask. Lee et al teach using the die attach area which has an adhesive but is not covered with solder mask so that the die attaches directly to the substrate surface resulting in an improved adhesion and reduced encapsulation defects for the encapsulated package (Col. 6, line 30; Col. 8, line 7; Fig. 1-7; Col. 1-8). Therefore, Lee et al's solder mask structure is applied to the APA to improve the adhesion and reduce encapsulation defects.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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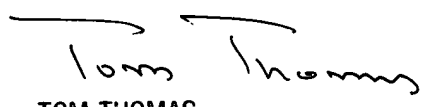
Papers related to this application may be submitted directly to Art Unit 2811 by facsimile transmission. Papers should be faxed to Art Unit via Technology Center 2800 fax center located in Crystal Plaza 4, room 4C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number in (703) 305-3410. The examiner can be normally reached on Monday-Friday from 08:30 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas, can be reached on (703) 308-2772. The fax number for the organization where this application or proceeding is assigned is (703) 308-7722 or 7724.

Nitin Parekh

12-03-02


TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800